An Evaluation of the Reference Envelope Approach Applied in the Baseline Ecological Risk Assessment for the Portland Harbor Site

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1.0 Introduction

In July, 2011, the Lower Willamette Group (LWG) prepared a baseline ecological risk assessment (BERA) to support the Remedial Investigation/Feasibility Study (RI/FS) for the Portland Harbor Site (Windward Environmental LLC 2011). In the BERA, the LWG evaluated risks to benthic invertebrates, in part, using the results of sediment toxicity tests. These toxicity test results were evaluated using a reference envelope approach, as described in the guidance provided to the LWG by United States Environmental Protection Agency (USEPA; MacDonald and Landrum 2008). To support USEPA's evaluation of the BERA, MacDonald Environmental Sciences Ltd. (MESL; in partnership with CDM Federal Programs) was tasked with conducting an evaluation of the methods that LWG used to interpret the toxicity test results. This memorandum summarizes the results of that evaluation and complements the preliminary comments on the BERA that were submitted to USEPA in October 2011.

2.0 Evaluation of the Reference Envelopes Described in the Portland Harbour BERA

The evaluation of the reference envelope approach used in the Portland Harbor BERA was conducted using a step-wise approach that included:

- Conducting a review of the methods that were used to screen candidate reference sediment samples;
- Conducting a review of the methods that were used to calculate the reference envelope for each toxicity test endpoint;
- Re-running the screen to identify samples that qualify as reference sediment samples;
- Re-calculating the reference envelopes for each toxicity test endpoint using the data for qualified reference stations (i.e., whole-sediment chemistry lower than conservative sediment quality benchmarks); and,
- Comparing the results of the reference envelope calculations conducted for the BERA and those conducted using qualified reference sediment samples.

Each of these steps are further described in the following sections of this memorandum. In addition, the results of these evaluations are presented in this document.

2.1 Review of the Methods Used to Screen the Sediment Chemistry Data for the Candidate Reference Sediment Samples

In the first step of the reference envelope development process, candidate reference sediment samples are identified. Such samples are typically collected in the vicinity of the site under investigation, but spatially removed from point source discharges of contaminants. In this way, the sediment samples that are selected for use in the reference envelope calculations are likely to have physical characteristics that are similar to those at the site under investigation and chemical characteristics that reflect regional background conditions. For the Portland Harbor BERA, LWG identified 24 samples collected at upriver locations on the Willamette River or within the boundaries of the site as candidate reference sediments for the Portland Harbor BERA (Table 1).

As part of the evaluation of candidate reference sediment samples, the sediment chemistry data for all of the candidate reference sediment samples were screened using toxicity screening values (TSVs) available from various sources. In the draft BERA, the LWG identified TSVs for five groups of chemicals of potential concern (COPCs), including metals (nine individual metals), butyltins (TBT), PAHs (including 17 individual PAHs, biphenyl, and three PAH mixtures), dibenzofuran, total PCBs, and organochlorine pesticides (nine substances). Due to the limitations of the BERA data set (i.e., SEM and AVS data were not available), the LWG indicated that it was not possible to apply all of the criteria described in MacDonald and Landrum (2008) for evaluating candidate reference sediment samples at the Portland Harbor site. Consequently, USEPA and the LWG agreed to apply the following revised criteria to screen sediment chemistry data for candidate reference sediment samples:

- Each sediment toxicity test should meet standard performance criteria, including an evaluation of potential interference from ammonia;
- The concentrations of all measured metals, PAHs, and PCBs are below the lower of Regional Sediment Evaluation Team (RSET) screening level 1 (SL1) or Probable Effects Concentrations (PECs);
- Mean PEC-Q < 0.1;
- ÓESB-TU_{PAHs} < 0.1;
- Control-adjusted response rate should not exceed the Tier II levels applied in the National Sediment Inventory (USEPA 2004).

The criteria for sediment chemistry that were applied by LWG are not consistent with the guidance that was provided in MacDonald and Landrum (2008). However, we understand that USEPA approved the use of less stringent chemical criteria for

identifying reference sediment samples. Based on a review of the sediment chemistry data for the 24 sediment samples that were identified by the LWG, it is apparent that 17 of these samples met the chemical criteria that were agreed to by USEPA and LWG (Table 1). While LWG identified 18 sediment samples as having met the chemical criteria, one of these samples was a duplicate for the purpose of toxicity testing and duplicate chemistry data were not generated for this samples split. Accordingly, we treated the original sample and the duplicate sample as one sample and averagedthe toxicity test results.

It is important to note that the selected sediment quality benchmarks (i.e., PECs) used in the BERA do not represent conservative sediment quality benchmarks. It is recommended that Threshold Effect Concentrations (TECs) be used as screening values (instead of PECs) for evaluating candidate reference sediment samples. The TEC values are conservative sediment quality benchmarks, below which adverse effects are not expected to occur. By comparison, the PEC values represent thresholds above which adverse effects are expected to occur more often than not (MacDonald*et al.* 2000). As the objective of the reference envelope approach is to identify the range of responses of benthic invertebrates exposed to sediment samples similar to those from the site, except for the presence of contaminants, the use of the more conservative TEC values in the sediment quality screening process would provide a better basis for identifying reference sediment samples.

The 2006 RSET SL1 values were also used as chemical criteria in the draft BERA. While these values could be used in the evaluation of candidate reference sediment samples, Washington State Department of Ecology recently published "Development of Benthic SQVs for Freshwater Sediments in Washington, Oregon, and Idaho" (Michelsen 2011). These values could also be considered in the suite of values that are compiled to establish the TSV for evaluating candidate reference sediment samples to support the BERA of the Portland Harbor site.

> ***Conclusion:*** **All of the sediment samples used by LWG to develop reference envelopes for the various toxicity test endpoints (n=17) met the chemical criteria that were selected for evaluating candidate reference sediment samples. Therefore, it is concluded that LWG followed the guidance provided by USEPA for screening the sediment chemistry data for candidate reference sediment samples.**

2.2 Review of the Methods Used to Evaluate the Toxicity Test Results for the Candidate Reference Sediment Samples

In addition to the chemical criteria discussed above, a number of biological criteria were also established to support identification of reference sediment samples for use in calculating reference envelopes for the various toxicity test endpoints. According to the information contained in the BERA documentation, LWG used the biological criteria specified in MacDonald and Landrum (2008) to evaluate the candidate reference sediment samples. More specifically:

- Control-adjusted response rate should not exceed the minimum significant difference (MSD) for each toxicity test endpoint; or,
- Control-adjusted response rate should not exceed the Tier II levels applied in the National Sediment Inventory (NSI; USEPA 2004; i.e., in the absence of an MSD for a toxicity test endpoint).

None of the toxicity test endpoints used in the Portland Harbor BERA have MSD values published in the literature. For this reason the Tier II levels presented in the NSI should have been used as biological criteria for evaluating candidate reference sediment samples.

To support the NSI, USEPA developed a system for classifying sediment samples into three categories based on the results of whole-sediment toxicity tests, including Tier 1, Tier 2, and Tier 3. Adverse effects on aquatic life or human health were considered to be probable for Tier 1 sediment samples. Adverse effects on aquatic life or human health were considered to be possible for Tier 2 sediment samples. There was no indication of adverse effects for the Tier 3 sediment samples. The Tier 1 and 2 levels, for the selected toxicity tests, expressed on a control-adjusted basis, are:

Test Organism	Endpoint	Tier 1 Level	Tier 2 Level
Hyalella azteca	Survival	< 75%	< 90%
	Length	< 90%	< 95%
	Weight	< 70%	< 90%
	Biomass	None (< 52.5%)	None (< 81%)
Chironomus dilutus	Survival	< 75%	< 90%
	Length	< 90%	< 95%
	Weight	< 70%	< 90%
	Biomass	None (< 52.5%)	None (< 81%)

(Note: The NSI did not explicitly identify Tier II levels for biomass; This value was calculated as the product of the Tier II levels for survival and weight because biomass is calculated as the product of the survival and weight response rates; Alternatively, the samples that are used to calculate the reference envelope for biomass must meet both the survival and weight criteria). Application of these criteria necessitate control normalization of the underlying response data for each of the candidate reference sediment samples. Based on our evaluation of the information presented in the BERA, it appears that LWG has correctly control-normalized the response data for the candidate reference sediment samples.

Examination of the underlying toxicity test results indicated that, at least, some of the candidate reference sediment samples that were qualified by LWG should have been disqualified using these biological criteria (Table 2 and 3). While all of the midge survival and biomass data for the candidate reference sediment samples met these biological criteria (Table 2), one of the samples had unacceptably low amphipod survival and six of the samples had unacceptably low amphipod biomass (Table 3). Therefore, it is not clear that the LWG followed the guidance provided by USEPA on the selection and application of biological criteria.

> ***Conclusion*: Based on the results of our evaluation, it is concluded that LWG did not follow the guidance provided by USEPA on the selection and application of biological criteria for evaluating candidate reference sediment samples.**

2.3 Development of the Reference Envelopes for the Selected Toxicity Test Endpoints

Following evaluation of the candidate reference sediment samples, LWG calculated reference envelopes for amphipod survival and biomass and for midge survival and biomass using the response data for the qualified reference sediment samples. This process involved:

- Fitting the response data to a number of probability distributions;
- Selecting the distributions that fit the data best; and,
- Calculating the lower 5th percentile of the response data.

The 5th percentile response for each toxicity test endpoint was then selected as the reference envelope value (REV). Sediment samples with response values higher than the REV were designated as not toxic (i.e., Level 0 Toxicity). Sediment samples with response values lower than the REV were designation as having low (i.e., Level 1 Toxicity), moderate (i.e., Level 2 Toxicity), or high (i.e., Level 3 Toxicity) levels of toxicity, depending on the magnitude of the response. The methods that were used by LWG to generate the REVs for the four toxicity test endpoints are consistent with the guidance provided by USEPA (MacDonald and Landrum 2008). The REVs that were developed by LWG are presented in Table 4. The REVs that were calculated using only the data for the samples that qualified as reference sediment samples based on our e-evaluation of the underlying data are also presented in Table 4.

Conclusion: **The methods used by LWG to calculate the REVs appear to be consistent with USEPA guidance. Differences between the LWG REVs and our recalculated REVs are due to differences in the underlying data used to calculate the 5th percentile values.**

2.4 Re-evaluation of Sediment Toxicity using the Revised Reference Envelope Values

The LWG and USEPA have agreed to classify sediment samples into four categories of toxicity based on the magnitude of exceedance of the reference envelope values for each toxicity test. These included Level 0 (reference envelope range; RE range), Level 1 (within 10% of the REV), Level 2 (between 10% and 20% lower than the REV), and Level 3 (>20% lower than the REV). The control-adjusted response values that correspond to each of these toxicity levels are designated below:

Biological Effects Ranges	**Midge Survival**	**Midge Biomass**	**Amphipod Survival**	**Amphipod Biomass**
Level 0 (RE)	≥93.9%	>91.0%	≥88.1%	≥73.6%
Level 1	≥84-5-93.9%	≥81.9-91.0%	≥79.3 - 88.1%	≥66.2-73.6%
Level 2	≥75.1-84.5%	≥72.8-81.9%	≥70.5-79.3%	≥58.9-66.2%
Level 3	<75.1%	<72.8%	<70.5%	<58.9%

Based on our re-evaluation of the REVs, sediment samples would be classified into these four categories of toxicity using the following table (all values are expressed on a control-adjusted basis):

Biological Effects Ranges	**Midge Survival**	**Midge Biomass**	**Amphipod Survival**	**Amphipod Biomass**
Level 0 (RE)	≥94.9-113%	>95.3-135%	≥92.9-103%	≥84.8-108%
Level 1	≥85.4-94.9%	≥85.8-95.3%	≥83.6-92.9%	≥76.3-84.8%
Level 2	≥75.9-85.4%	≥76.2-85.8%	≥74.3-83.6%	≥67.8-76.3%
Level 3	<75.9%	<76.2%	<74.3%	<67.8%

Using these criteria, toxicity classifications were revised for each of the sediment samples collected at the Portland Harbor Site. These revised classifications are presented in Table 5 and Table 6.

3.0 References Cited

Windward Environmental LLC. 2011. Portland Harbor RI/FS. Appendix G: Baseline Ecological Assessment. Prepared for the Lower Willamette Group. Portland. Oregon.

MacDonald, D.D. and P.F. Landrum. 2008. An evaluation of the approach for assessing risks to the benthic invertebrate community at the Portland Harbor Superfund Site. Prepared for U.S. Environmental Protection Agency and Parametrix, Inc. Nanaimo, British Columbia.

MacDonald, D.D., C.G. Ingersoll, and T.A. Berger. 2000. Development and evaluation of consensus-based sediment quality guidelines for freshwater ecosystems. Archives of Environmental Contamination and Toxicology 39:20-31.

Michelsen, T. 2011. Development of Benthic SQVs for Freshwater Sediments in Washington, Oregon, and Idaho. Washington State Department of Ecology. Olympia, Washington.

USEPA (U.S. Environmental Protection Agency). 2004. The incidence and severity of sediment contamination in surface waters of the United States. National Sediment Quality Survey: Second Edition (updated). EPA 823-R-02-013. Office of Research and Development. Washington, District of Columbia.

Table 1. Identification of the sediment samples that meet the selected chemical criteria for reference sediment samples.

Station ID	Whole-Sediment Chemistry < TSVs	Retained as Candidate Reference Station?
G766[1]	Yes	**Yes**
G767[1]	Yes	**Yes**
G785	No	No
G786	Yes	**Yes**
G787	No	No
G788	Yes	**Yes**
U1C-1	Yes	**Yes**
U1C-2	Yes	**Yes**
U1C-3	No	No
U2C-1	Yes	**Yes**
U2C-2	No	No
U2C-3	Yes	**Yes**
U3C-1	Yes	**Yes**
U3C-2	Yes	**Yes**
U3C-3	Yes	**Yes**
U4Q-1	Yes	**Yes**
U4Q-2	Yes	**Yes**
U4Q-3	Yes	**Yes**
U5Q-1	Yes	**Yes**
U5Q-2	Yes	**Yes**
U5Q-3	Yes	**Yes**
U6TOC-1	No	No
U6TOC-2	No	No
U6TOC-3	No	No

TSV = Toxicity Screening Value.

[1] Internal Reference Stations.

Table 2. Summary of *Chironomus dilutus* 10-day toxicity testing results[1] for candidate reference sediment samples for the Portland Harbor site (samples that meet biological criteria are shown in bold).

Station ID	Survival		Biomass	
	Response (%)	Control Adjusted Response (%)	Response (mg)	Control Adjusted Response (%)
G766[2]	85.0	**95.8**	0.809	**112**
G767[2]	91.3	**103**	0.767	**107**
G786	84.4	**95.8**	0.741	**97.9**
G788	86.9	**98.6**	0.640	**84.9***
U1C-1	95	**112**	1.12	**125**
U1C-2	88.8	**104**	1.06	**119**
U2C-1	88.8	**104**	1.19	**133**
U2C-3	88.8	**104**	1.05	**117**
U3C-1	90	**106**	1.15	**129**
U3C-2	88.8	**104**	1.15	**129**
U3C-3	96.3	**113**	1.21	**135**
U4Q-1	93.8	**110**	1.02	**114**
U4Q-2	93.8	**110**	1.16	**130**
U4Q-3	91.3	**107**	1.00	**112**
U5Q-1	87.5	**103**	1.00	**113**
U5Q-2	77.5	**91.2**	0.894	**100**
U5Q-3	93.8	**110**	1.06	**119**

[1] All data have been taken from the Portland Harbor Query Manager database; results inconsistent with the July 2011 version of the BERA are noted with an asterisk (*).

[2] Internal Reference Stations.

Table 3. Summary of *Hyalella azteca* 28-day toxicity testing results[1] for candidate reference sediment samples for the Portland Harbor site (samples that meet biological criteria are shown in bold).

Station ID	Survival		Biomass	
	Response (%)	Control Adjusted Response (%)	Response (mg)	Control Adjusted Response (%)
G766[2]	90.0	**90.0**	0.155	75.3
G767[2]	93.8	**93.8**	0.167	**81.2**
G786	83.1	87.6	0.135	71.2
G788	89.4*	**94.3**	0.146	77.6*
U1C-1	92.5	**96.1**	0.404	**107**
U1C-2	96.3	**100**	0.375	**99.9**
U2C-1	96.3	**100**	0.382	**102**
U2C-3	95.0	**98.7**	0.43	**115**
U3C-1	97.5	**101**	0.34	**89.2**
U3C-2	97.5	**101**	0.339	**90.1**
U3C-3	97.5	**101**	0.332	**88.3**
U4Q-1	95.0	**98.7**	0.28	74.7
U4Q-2	96.3	**100**	0.277	73.7
U4Q-3	96.3	**100**	0.285	76
U5Q-1	97.5	**101**	0.339	**90.3**
U5Q-2	98.8	**103**	0.361	**104**
U5Q-3	95.0	**98.7**	0.342	**91.1**

[1] All data have been taken from the Portland Harbor Query Manager database; results inconsistent with the July 2011 version of the BERA are noted with an asterisk (*).

[2] Internal Reference Stations.

Table 4. Summary of the estimated minimum values of the reference envelopes (REVs) developed using reference stations described in the Portland Harbor BERA.

Endpoint	2011 Draft RI/FS[1]	MESL Re-Evaluation
Chironomus dilutus		
Survival	93.9	94.9
Biomass	91	95.3
Hyalella azteca		
Survival	88.1	92.9
Biomass	73.6	84.8

[1] These 5th percentile values were presented in the 2011 Draft of the RI/FS (Windward Environmental LLC 2011).

Table 5. Toxicity level (TL)[1] based on *Chironomus dilutus* response assigned to each sediment sample[2] collected at the Portland Harbor site.

Station ID / Toxicity Level	*Chironomus dilutus*					
	Survival			Biomass		
	Control-Adjusted Response (%)	Original TL[1]	Revised TL[1]	Control-Adjusted Response (%)	Original TL[1]	Revised TL[1]
D1-1	92.7	1	1	93.0	0	1
D2	107	0	0	111	0	0
G007-1	83.8	2	2	89.6	1	1
G009	97.1	0	0	106	0	0
G010	95.6	0	0	95.7	0	0
G011	91.2	1	1	116	0	0
G015	104	0	0	112	0	0
G017	76.5	2	2	87.5	1	1
G019	100	0	0	119	0	0
G020	101	0	0	102	0	0
G024	97.1	0	0	105	0	0
G025	95.6	0	0	117	0	0
G026	95.6	0	0	99.7	0	0
G027	103	0	0	123	0	0
G033	95.6	0	0	94.6	0	1
G034	98.5	0	0	118	0	0
G035	104	0	0	102	0	0
G038	105	0	0	123	0	0
G060	103	0	0	120	0	0
G061	103	0	0	102	0	0
G062	91.2	1	1	95.7	0	0
G064	98.5	0	0	113	0	0
G066	106	0	0	115	0	0
G067	106	0	0	112	0	0
G073	98.5	0	0	108	0	0
G074	103	0	0	121	0	0
G077	88.9	1	1	89.6	1	1
G078	97.1	0	0	103	0	0
G079	95.6	0	0	99.3	0	0
G080	100	0	0	112	0	0
G082	95.8	0	0	110	0	0
G083	106	0	0	115	0	0
G085	70.6	3	3	38.3	3	3
G086	81.9	2	2	81.0	2	2
G088	65.3	3	3	65.9	3	3
G089	69.1	3	3	60.4	3	3
G090	83.3	2	2	65.1	3	3
G091	79.2	2	2	74.5	2	3
G092	0.00	3	3	0.00	3	3
G093	98.7	0	0	78.2	2	2
G096	87.5	1	1	91.9	0	1

Table 5. Toxicity level (TL)[1] based on *Chironomus dilutus* response assigned to each sediment sample[2] collected at the Portland Harbor site.

Station ID / Toxicity Level	*Chironomus dilutus*					
	Survival			Biomass		
	Control-Adjusted Response (%)	Original TL[1]	Revised TL[1]	Control-Adjusted Response (%)	Original TL[1]	Revised TL[1]
G099	77.8	2	2	72.7	3	3
G103	80.6	2	2	82.4	1	2
G105	68.1	3	3	61.4	3	3
G106	95.8	0	0	93.0	0	1
G109	87.5	1	1	74.9	2	3
G111	86.8	1	1	94.5	0	1
G112	93.1	1	1	83.8	1	2
G117	40.3	3	3	18.1	3	3
G121	83.3	2	2	83.2	1	2
G122	79.2	2	2	70.0	3	3
G123	82.9	2	2	91.4	0	1
G124	90.5	1	1	101	0	0
G127	91.7	1	1	113	0	0
G130	97.2	0	0	114	0	0
G133	81.9	2	2	102	0	0
G136	95.8	0	0	109	0	0
G139	97.2	0	0	129	0	0
G142	87.5	1	1	121	0	0
G147	87.5	1	1	108	0	0
G155	93.4	1	1	72.5	3	3
G157	48.7	3	3	14.3	3	3
G160	43.4	3	3	19.1	3	3
G161	73.7	3	3	30.4	3	3
G163	103	0	0	100	0	0
G164	97.2	0	0	104	0	0
G166	100	0	0	96.9	0	0
G170	103	0	0	123	0	0
G172	93.1	1	1	93.9	0	1
G176	38.9	3	3	20.8	3	3
G178	90.3	1	1	95.9	0	0
G179	31.9	3	3	19.6	3	3
G180	91.7	1	1	83.3	1	2
G182	101	0	0	128	0	0
G184	97.2	0	0	119	0	0
G187	75.0	3	3	85.3	1	2
G197-1	98.6	0	0	105	0	0
G198	105	0	0	99.8	0	0
G199	100	0	0	101	0	0
G200	94.7	0	1	96.8	0	0
G202	101	0	0	107	0	0
G203-1	97.1	0	0	99.8	0	0

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Station ID / Toxicity Level	*Chironomus dilutus*					
	Survival			Biomass		
	Control-Adjusted Response (%)	Original TL[1]	Revised TL[1]	Control-Adjusted Response (%)	Original TL[1]	Revised TL[1]
G204	96.1	0	0	89.6	1	1
G205	94.7	0	1	120	0	0
G206	98.7	0	0	91.8	0	1
G207	90.8	1	1	88.4	1	1
G209	100	0	0	113	0	0
G210	69.7	3	3	61.8	3	3
G212-1	92.0	1	1	100	0	0
G213	100	0	0	83.9	1	2
G220	97.1	0	0	98.4	0	0
G221	101	0	0	108	0	0
G227	90.3	1	1	110	0	0
G228	107	0	0	127	0	0
G230	91.7	1	1	120	0	0
G231	101	0	0	119	0	0
G232	101	0	0	135	0	0
G234	100	0	0	107	0	0
G235	93.1	1	1	79.8	2	2
G240	94.4	0	1	118	0	0
G242	91.7	1	1	110	0	0
G244	103	0	0	118	0	0
G245	95.8	0	0	115	0	0
G247	101	0	0	108	0	0
G254	96.1	0	0	87.6	1	1
G260	101	0	0	125	0	0
G263	90.4	1	1	95.5	0	0
G264	53.4	3	3	28.4*	3	3
G267	103	0	0	112	0	0
G268	95.9	0	0	108	0	0
G269	75.3	2	3	41.6	3	3
G270-1	73.5	3	3	55.6	3	3
G273	93.2	1	1	71.9	3	3
G274	72.0	3	3	43.7	3	3
G276	82.2	2	2	79.7	2	2
G277	96.0	0	0	101	0	0
G278	68.5	3	3	56.9	3	3
G280	97.3	0	0	98.6	0	0
G282	94.7	0	1	90.0	1	1
G283	4.11	3	3	2.06	3	3
G284	100	0	0	96.9	0	0
G288	0.00	3	3	0.00	3	3
G292	90.4	1	1	107	0	0

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Station ID / Toxicity Level	*Chironomus dilutus*					
	Survival			Biomass		
	Control-Adjusted Response (%)	Original TL[1]	Revised TL[1]	Control-Adjusted Response (%)	Original TL[1]	Revised TL[1]
G294-1	0.00	3	3	0.00	3	3
G295	101	0	0	102	0	0
G296	98.7	0	0	103	0	0
G298	0.00	3	3	0.00	3	3
G301	101	0	0	110	0	0
G302	0.00	3	3	0.00	3	3
G303	94.7	0	1	105	0	0
G308	71.2	3	3	61.8	3	3
G311-1	16.2	3	3	2.85	3	3
G315	94.5	0	1	102	0	0
G316	95.9	0	0	113	0	0
G318	95.9	0	0	95.8	0	0
G320	67.1	3	3	59.9	3	3
G321	97.1	0	0	79.8	2	2
G323	97.3	0	0	124	0	0
G324-1	85.3	1	2	111	0	0
G327	90.4	1	1	49.9	3	3
G329	110	0	0	110	0	0
G331	104	0	0	113	0	0
G333	94.5	0	1	110	0	0
G334	110	0	0	103	0	0
G335	94.5	0	1	102	0	0
G336	89.0	1	1	104	0	0
G339	84.9	1	2	67.6	3	3
G342	94.6	0	1	99.8	0	0
G345-1	97.1	0	0	91.1	0	1
G346	97.3	0	0	105	0	0
G347	93.2	1	1	92.0	0	1
G348	69.9	3	3	59.6	3	3
G350	95.9	0	0	98.3	0	0
G351	101	0	0	90.9	1	1
G352	94.6	0	1	101	0	0
G353-1	106	0	0	104	0	0
G355	93.3	1	1	87.3	1	1
G359	84.1	2	2	80.7	2	2
G360	50.7	3	3	43.3	3	3
G362-1	92.1	1	1	87.9	1	1
G364	91.9	1	1	83.9	1	2
G366	0.00	3	3	0.00	3	3
G367	101	0	0	101	0	0
G368	12.2	3	3	4.60	3	3

Table 5. Toxicity level (TL)[1] based on *Chironomus dilutus* response assigned to each sediment sample[2] collected at the Portland Harbor site.

Station ID / Toxicity Level	*Chironomus dilutus*					
	Survival			Biomass		
	Control-Adjusted Response (%)	Original TL[1]	Revised TL[1]	Control-Adjusted Response (%)	Original TL[1]	Revised TL[1]
G371	42.1	3	3	44.4	3	3
G372-1	112	0	0	97.6	0	0
G376	97.3	0	0	99.9	0	0
G377	98.7	0	0	103	0	0
G380	94.7	0	1	104	0	0
G382	96.0	0	0	108	0	0
G383	96.0	0	0	111	0	0
G384-1	95.7	0	0	86.6	1	1
G385	96.0	0	0	100	0	0
G386	103	0	0	125	0	0
G387	98.6	0	0	99.8	0	0
G389	84.0	2	2	94.5	0	1
G390	87.0	1	1	46.7	3	3
G392	100	0	0	81.4	2	2
G393	98.7	0	0	90.0	1	1
G396	90.5	1	1	95.0	0	1
G398	106	0	0	113	0	0
G401	98.7	0	0	92.6	0	1
G403	96.1	0	0	95.1	0	1
G405	93.2	1	1	109	0	0
G408	93.3	1	1	106	0	0
G409	103	0	0	105	0	0
G413	98.7	0	0	105	0	0
G415	103	0	0	90.6	1	1
G416	100	0	0	93.4	0	1
G417	101	0	0	102	0	0
G420	96.0	0	0	103	0	0
G425	97.3	0	0	115	0	0
G426	101	0	0	99.6	0	0
G430	97.4	0	0	102	0	0
G437	103	0	0	95.7	0	0
G441	101	0	0	105	0	0
G444	104	0	0	92.5	0	1
G445	103	0	0	73.2	2	3
G450-1	87.0	1	1	84.8	1	2
G453	5.48	3	3	1.11	3	3
G454	95.9	0	0	121	0	0
G455	76.8	2	2	45.0	3	3
G456	103	0	0	107	0	0
G457	97.3	0	0	109	0	0
G458	103	0	0	104	0	0

Table 5. Toxicity level (TL)[1] based on *Chironomus dilutus* response assigned to each sediment sample[2] collected at the Portland Harbor site.

Station ID / Toxicity Level	*Chironomus dilutus*					
	Survival			Biomass		
	Control-Adjusted Response (%)	Original TL[1]	Revised TL[1]	Control-Adjusted Response (%)	Original TL[1]	Revised TL[1]
G461	95.9	0	0	118	0	0
G467	97.3	0	0	136	0	0
G468	87.7	1	1	105	0	0
G469	91.3	1	1	83.9	1	2
G473	101	0	0	124	0	0
G474	103	0	0	109	0	0
G477	94.5	0	1	116	0	0
G480	98.6	0	0	95.0	0	1
G492-1	104	0	0	109	0	0
G497	101	0	0	98.6	0	0
G6121	104	0	0	93.6	0	1
G613	101	0	0	101	0	0
G622	87.1	1	1	86.7	1	1
G623	100	0	0	92.7	0	1
G625	109*	0	0	102	0	0
G628	98.6	0	0	91.4	0	1
G6371	97.1	0	0	96.2	0	0
G638	107	0	0	101	0	0
G643	96.3*	0	0	90.6	1	1
G648	103	0	0	92.0	0	1
G653	101	0	0	85.8	1	2
G654	78.6	2	2	48.2	3	3
G656	91.5	1	1	88.3	1	1
G663	94.3	0	1	75.8	2	3
G665	94.3	0	1	94.5*	0	1
G670	90.1	1	1	107	0	0
G671	111	0	0	96.0	0	0
G672	76.1	2	2	79.4	2	2
G674	98.6	0	0	90.6	1	1
G675	98.6	0	0	109	0	0
G683	101	0	0	88.4*	1	1
G6841	100	0	0	98.6	0	0
G685	104	0	0	96.8	0	0
G689	51.4	3	3	45.1	3	3
G693	98.6	0	0	83.7	1	2
G694	103	0	0	71.5	3	3
G700	100	0	0	88.3	1	1
G707	101	0	0	92.0	0	1
G711	100	0	0	93.6	0	1
G713	95.7	0	0	87.5	1	1
G718	101	0	0	84.8	1	2

Table 5. Toxicity level (TL)[1] based on *Chironomus dilutus* response assigned to each sediment sample[2] collected at the Portland Harbor site.

Station ID / Toxicity Level	*Chironomus dilutus*					
	Survival			Biomass		
	Control-Adjusted Response (%)	Original TL[1]	Revised TL[1]	Control-Adjusted Response (%)	Original TL[1]	Revised TL[1]
G722	106	0	0	87.8	1	1
G736	106	0	0	100	0	0
G737	92.9	1	1	85.6*	1	2
G740	95.8	0	0	104	0	0
G741	100	0	0	105*	0	0
G744	84.5	1	2	96.7*	0	0
G745	101	0	0	104	0	0
G746	87.3	1	1	95.2	0	1
G750	87.3	1	1	92.5	0	1
G751	95.8	0	0	103	0	0
G752	88.7	1	1	100*	0	0
G755	95.8	0	0	114	0	0
G756	85.9	1	1	103	0	0
G763	97.2	0	0	123	0	0
G766	95.8	0	0	112	0	0
G767	103	0	0	107	0	0
G769	90.1	1	1	101*	0	0
G772	97.2	0	0	124	0	0
G775	103	0	0	127	0	0
G776	103	0	0	130*	0	0
G777	93.0	1	1	92.5*	0	1
G778	80.3	2	2	85.8	1	1
G779	87.3	1	1	99.6	0	0
G780	97.2	0	0	115	0	0
G781	95.8	0	0	103	0	0
G785	95.8	0	0	109	0	0
G786	95.8	0	0	97.9	0	0
G787	89.4	1	1	82.8	1	2
G788	98.6	0	0	84.9*	1	2
U1C-1	112	0	0	125	0	0
U1C-2	104	0	0	119	0	0
U1C-3	110	0	0	118	0	0
U2C-1	104	0	0	133	0	0
U2C-2	106	0	0	117	0	0
U2C-3	104	0	0	117	0	0
U3C-1	106	0	0	129	0	0
U3C-2	104	0	0	129	0	0
U3C-3	113	0	0	135	0	0
U4Q-1	110	0	0	114	0	0
U4Q-2	110	0	0	130	0	0
U4Q-3	107	0	0	112	0	0

Table 5. Toxicity level (TL)[1] based on *Chironomus dilutus* response assigned to each sediment sample[2] collected at the Portland Harbor site.

Station ID / Toxicity Level	*Chironomus dilutus*					
	Survival			Biomass		
	Control-Adjusted Response (%)	Original TL[1]	Revised TL[1]	Control-Adjusted Response (%)	Original TL[1]	Revised TL[1]
U5Q-1	103	0	0	113	0	0
U5Q-2	91.2	1	1	100	0	0
U5Q-3	110	0	0	119	0	0
U6TOC-1	112	0	0	115	0	0
U6TOC-2	103	0	0	119	0	0
U6TOC-3	104	0	0	109	0	0
Level 0		188 of 293 (64.2%)	174 of 293 (59.4%)		201 of 293 (68.6%)	174 of 293 (59.4%)
Level 1		54 of 293 (18.4%)	65 of 293 (22.2%)		37 of 293 (12.6%)	49 of 293 (16.7%)
Level 2		19 of 293 (6.5%)	21 of 293 (7.2%)		12 of 293 (4.1%)	23 of 293 (7.8%)
Level 3		32 of 293 (10.9%)	33 of 293 (11.3%)		43 of 293 (14.7%)	47 of 293 (16%)

[1] Toxicity Levels are: 0 (within the reference envelope range); 1 (within 10% of the REV); 2 (between 10% and 20% lower than the REV); 3 (>20% lower than the REV).

[2] All data have been taken from the Portland Harbor Query Manager database; results inconsistent with the July 2011 version of the BERA are noted with an asterisk (*).

Table 6. Toxicity level (TL)[1] based on *Hyalella azteca* response assigned to each sediment sample[2] collected at the Portland Harbor site.

Station ID / Toxicity Level	*Hyalella azteca*					
	Survival			Biomass		
	Control-Adjusted Response (%)	Original TL[1]	Revised TL[1]	Control-Adjusted Response (%)	Original TL[1]	Revised TL[1]
D1-1	104	0	0	66.2	1	3
D2	100	0	0	86.0	0	0
G007-1	97.5	0	0	67.5	1	3
G009	91.3	0	1	97.8	0	0
G010	96.3	0	0	74.4	0	2
G011	97.5	0	0	105	0	0
G015	93.8	0	0	74.1	0	2
G017	95.0	0	0	77.0	0	1
G019	91.3	0	1	149	0	0
G020	100	0	0	76.6	0	1
G024	96.2	0	0	57.4	3	3
G025	98.7	0	0	165	0	0
G026	96.3	0	0	78.6	0	1
G027	97.4	0	0	90.4	0	0
G033	96.2	0	0	67.9	1	2
G034	101	0	0	82.7	0	1
G035	96.2	0	0	83.9	0	1
G038	103	0	0	103	0	0
G060	96.3	0	0	96.7	0	0
G061	100	0	0	64.4	2	3
G062	100	0	0	73.6	1	2
G064	95.0	0	0	95.2	0	0
G066	91.3	0	1	106	0	0
G067	101	0	0	73.6	1	2
G073	93.6	0	0	95.9	0	0
G074	94.9	0	0	83.0	0	1
G077	101	0	0	87.3	0	0
G078	80.8	1	2	69.3	1	2
G079	89.7	0	1	73.0	1	2
G080	97.4	0	0	95.5	0	0
G082	98.7	0	0	104	0	0
G083	92.3	0	1	57.0	3	3
G085	82.1	1	2	69.2	1	2
G086	101	0	0	102	0	0
G088	100	0	0	87.1	0	0
G089	94.9	0	0	65.9	2	3
G090	100	0	0	98.2	0	0
G091	98.7	0	0	106	0	0
G092	0.00	3	3	0.00	3	3
G093	93.7	0	0	75.0	0	2
G096	100	0	0	98.3	0	0

Table 6. Toxicity level (TL)[1] based on *Hyalella azteca* response assigned to each sediment sample[2] collected at the Portland Harbor site.

Station ID / Toxicity Level	*Hyalella azteca*					
	Survival			Biomass		
	Control-Adjusted Response (%)	Original TL[1]	Revised TL[1]	Control-Adjusted Response (%)	Original TL[1]	Revised TL[1]
G099	104	0	0	95.6	0	0
G103	101	0	0	89.7	0	0
G105	103	0	0	118	0	0
G106	97.4	0	0	94.9	0	0
G109	103	0	0	90.0	0	0
G111	97.4	0	0	70.9	1	2
G112	98.7	0	0	93.6	0	0
G117	86.8	1	1	89.0	0	0
G121	100	0	0	95.2	0	0
G122	105	0	0	77.6	0	1
G123	89.6	0	1	58.1	3	3
G124	94.9	0	0	74.6	0	2
G127	111	0	0	87.1	0	0
G130	110	0	0	103	0	0
G133	104	0	0	85.5	0	0
G136	98.6	0	0	84.5	0	1
G139	106	0	0	97.6	0	0
G142	106	0	0	117	0	0
G147	101	0	0	95.9	0	0
G155	100	0	0	66.4	1	3
G157	50.7	3	3	44.4	3	3
G160	81.8	1	2	73.1	1	2
G161	70.1	3	3	57.4	3	3
G163	98.7	0	0	97.6	0	0
G164	103	0	0	101	0	0
G166	88.3	0	1	81.0	0	1
G170	103	0	0	81.6	0	1
G172	98.6	0	0	82.3	0	1
G176	66.2	3	3	60.2	2	3
G178	101	0	0	101	0	0
G179	15.5	3	3	21.3	3	3
G180	101	0	0	106	0	0
G182	104	0	0	103	0	0
G184	106	0	0	88.9	0	0
G187	101	0	0	76.3	0	2
G197-1	101	0	0	104	0	0
G198	101	0	0	89.1	0	0
G199	92.2	0	1	82.9	0	1
G200	97.5	0	0	66.1	2	3
G202	100	0	0	87.9	0	0
G203-1	93.8	0	0	72.5	1	2

Table 6. Toxicity level (TL)[1] based on *Hyalella azteca* response assigned to each sediment sample[2] collected at the Portland Harbor site.

Station ID / Toxicity Level	*Hyalella azteca*					
	Survival			Biomass		
	Control-Adjusted Response (%)	Original TL[1]	Revised TL[1]	Control-Adjusted Response (%)	Original TL[1]	Revised TL[1]
G204	101	0	0	74.7	0	2
G205	101	0	0	71.3	1	2
G206	101	0	0	72.2	1	2
G207	92.2	0	1	82.0	0	1
G209	100	0	0	120	0	0
G210	31.7	3	3	29.5	3	3
G212-1	100	0	0	74.8	0	2
G213	93.7	0	0	68.6	1	2
G220	93.8	0	0	76.7	0	1
G221	96.3	0	0	108	0	0
G227	106	0	0	101	0	0
G228	107	0	0	91.4	0	0
G230	108	0	0	86.2	0	0
G231	96.1	0	0	87.5	0	0
G232	103	0	0	92.1	0	0
G234	94.8	0	0	89.6	0	0
G235	100	0	0	89.8	0	0
G240	104	0	0	80.0	0	1
G242	104	0	0	85.7	0	0
G244	97.4	0	0	90.0	0	0
G245	104	0	0	63.0	2	3
G247	101	0	0	82.1	0	1
G254	97.4	0	0	85.3	0	0
G260	100	0	0	116	0	0
G263	107	0	0	78.4	0	1
G264	88.7	0	1	73.0	1	2
G267	97.2	0	0	62.0	2	3
G268	97.4	0	0	79.4	0	1
G269	93.0	0	0	76.3	0	2
G270-1	92.5	0	1	69.7	1	2
G273	70.9	2	3	56.7	3	3
G274	17.1	3	3	16.4	3	3
G276	104	0	0	68.4	1	2
G277	92.4	0	1	71.8	1	2
G278	106	0	0	90.3	0	0
G280	94.9	0	0	61.2	2	3
G282	94.9	0	0	71.3	1	2
G283	1.41	3	3	1.78	3	3
G284	100	0	0	72.1	1	2
G288	0.00	3	3	0.00	3	3
G292	92.1	0	1	94.0	0	0

Table 6. Toxicity level (TL)[1] based on *Hyalella azteca* response assigned to each sediment sample[2] collected at the Portland Harbor site.

Station ID / Toxicity Level	*Hyalella azteca*					
	Survival			Biomass		
	Control-Adjusted Response (%)	Original TL[1]	Revised TL[1]	Control-Adjusted Response (%)	Original TL[1]	Revised TL[1]
G294-1	0.00	3	3	0.00	3	3
G295	89.9	0	1	59.2	2	3
G296	98.7	0	0	54.2	3	3
G298	0.00	3	3	0.00	3	3
G301	97.4	0	0	87.4	0	0
G302	1.32	3	3	1.27	3	3
G303	96.1	0	0	65.2	2	3
G308	82.9	1	2	72.7	1	2
G311-1	61.3	3	3	75.0	0	2
G315	97.4	0	0	84.0	0	1
G316	101	0	0	109	0	0
G318	104	0	0	94.6	0	0
G320	98.7	0	0	83.6	0	1
G321	98.6	0	0	72.1	1	2
G323	92.1	0	1	102	0	0
G324-1	93.8	0	0	84.5	0	1
G327	93.4	0	0	81.2	0	1
G329	110	0	0	106	0	0
G331	97.4	0	0	104	0	0
G333	103	0	0	107	0	0
G334	92.5	0	1	86.8	0	0
G335	96.1	0	0	85.6	0	0
G336	97.4	0	0	84.1	0	1
G339	104	0	0	76.6	0	1
G342	94.9	0	0	64.9	2	3
G345-1	95.0	0	0	75.6	0	2
G346	96.2	0	0	52.9	3	3
G347	93.7	0	0	63.2	2	3
G348	96.1	0	0	95.7	0	0
G350	97.4	0	0	87.8	0	0
G351	100	0	0	62.0	2	3
G352	97.5	0	0	70.2	1	2
G353-1	107	0	0	85.8	0	0
G355	101	0	0	84.7	0	1
G359	103	0	0	71.6	1	2
G360	59.2	3	3	54.8	3	3
G362-1	92.4	0	1	77.0	0	1
G364	91.1	0	1	62.7	2	3
G366	32.9	3	3	30.8	3	3
G367	101	0	0	85.0	0	0
G368	17.7	3	3	30.6	3	3

Table 6. Toxicity level (TL)[1] based on *Hyalella azteca* response assigned to each sediment sample[2] collected at the Portland Harbor site.

Station ID / Toxicity Level	*Hyalella azteca*					
	Survival			Biomass		
	Control-Adjusted Response (%)	Original TL[1]	Revised TL[1]	Control-Adjusted Response (%)	Original TL[1]	Revised TL[1]
G371	39.2	3	3	47.1	3	3
G372-1	101	0	0	81.0	0	1
G376	101	0	0	72.7	1	2
G377	96.2	0	0	67.7	1	3
G380	91.1	0	1	89.1	0	0
G382	92.4	0	1	59.6	2	3
G383	97.5	0	0	88.8	0	0
G384-1	98.6	0	0	77.4	0	1
G385	97.4	0	0	79.1	0	1
G386	110	0	0	66.5	1	3
G387	103	0	0	75.4	0	2
G389	89.5	0	1	74.2	0	2
G390	2.78	3	3	2.06	3	3
G392	96.2	0	0	64.7	2	3
G393	96.2	0	0	79.6	0	1
G396	82.3	1	2	65.8	2	3
G398	94.4	0	0	56.6	3	3
G401	97.5	0	0	62.4	2	3
G403	97.5	0	0	79.4	0	1
G405	91.1	0	1	91.6	0	0
G408	92.1	0	1	77.9	0	1
G409	94.9	0	0	72.6	1	2
G413	100	0	0	87.0	0	0
G415	92.4	0	1	73.8	0	2
G416	100	0	0	63.2	2	3
G417	96.2	0	0	79.6	0	1
G420	98.7	0	0	80.4	0	1
G425	101	0	0	88.3	0	0
G426	93.7	0	0	68.3	1	2
G430	97.5	0	0	93.5	0	0
G437	94.9	0	0	78.3	0	1
G441	103	0	0	85.6	0	0
G444	100	0	0	73.6	0	2
G445	94.4	0	0	56.4	3	3
G450-1	106	0	0	78.3	0	1
G453	4.23	3	3	3.76	3	3
G454	103	0	0	80.2	0	1
G455	91.7	0	1	73.9	0	2
G456	103	0	0	75.0	0	2
G457	87.3	1	1	67.1	1	3
G458	101	0	0	72.3	1	2

Table 6. Toxicity level (TL)[1] based on *Hyalella azteca* response assigned to each sediment sample[2] collected at the Portland Harbor site.

Station ID / Toxicity Level	*Hyalella azteca*					
	Survival			Biomass		
	Control-Adjusted Response (%)	Original TL[1]	Revised TL[1]	Control-Adjusted Response (%)	Original TL[1]	Revised TL[1]
G461	98.6	0	0	70.1	1	2
G467	98.6	0	0	83.0	0	1
G468	103	0	0	55.4	3	3
G469	106	0	0	83.6	0	1
G473	101	0	0	76.9	0	1
G474	101	0	0	90.0	0	0
G477	108	0	0	85.2	0	0
G480	101	0	0	96.3	0	0
G492-1	107	0	0	82.3	0	1
G497	101	0	0	82.5	0	1
G6121	103	0	0	58.5	3	3
G613	88.8	0	1	64.6	2	3
G622	97.2	0	0	64.7	2	3
G623	94.4	0	0	64.7	2	3
G625	106	0	0	67.8	1	3
G628	101	0	0	62.4*	2	3
G6371	101	0	0	62.7	2	3
G638	97.2	0	0	62	2	3
G643	100	0	0	69	1	2
G648	100	0	0	60.6	2	3
G653	93.1	0	0	63.0	2	3
G654	95.8	0	0	70.4	1	2
G656	87.5	1	1	68.0	1	2
G663	100	0	0	63.0	2	3
G665	97.2	0	0	60.4	2	3
G670	86.3	1	1	71.6	1	2
G671	95.8	0	0	55.9	3	3
G672	88.8	0	1	58.9	2	3
G674	94.4	0	0	58.9	3	3
G675	87.5	1	1	71.1	1	2
G683	110	0	0	69.5	1	2
G6841	93.8	0	0	72.4	1	2
G685	104	0	0	62.3	2	3
G689	101	0	0	71.3	1	2
G693	100	0	0	59.5	2	3
G694	107	0	0	64.3	2	3
G700	100	0	0	61.5	2	3
G707	93.1	0	0	60.0	2	3
G711	97.2	0	0	60.2	2	3
G713	104	0	0	62.3	2	3
G718	101	0	0	65.1*	2	3

Table 6. Toxicity level (TL)[1] based on *Hyalella azteca* response assigned to each sediment sample[2] collected at the Portland Harbor site.

Station ID / Toxicity Level	*Hyalella azteca*					
	Survival			Biomass		
	Control-Adjusted Response (%)	Original TL[1]	Revised TL[1]	Control-Adjusted Response (%)	Original TL[1]	Revised TL[1]
G722	95.8	0	0	61.7	2	3
G736	98.6	0	0	68.1	1	2
G737	93.1	0	0	63.1*	2	3
G740	86.3	1	1	79.8	0	1
G741	88.8	0	1	66.4	1	3
G744	90.0	0	1	68.8	1	2
G745	90.0	0	1	69.3*	1	2
G746	91.3	0	1	71.4*	1	2
G750	83.8	1	1	64.8	2	3
G751	90.0	0	1	83.4	0	1
G752	85.0	1	1	63.6	2	3
G755	87.5	1	1	71.4	1	2
G756	80.0	1	2	75.3	0	2
G763	92.5	0	1	77.7	0	1
G766	90.0	0	1	75.3	0	2
G767	93.8	0	0	81.2	0	1
G769	91.3	0	1	79.4	0	1
G772	92.5	0	1	78.5	0	1
G775	90.0	0	1	70.7	1	2
G776	83.8	1	1	68.9*	1	2
G777	77.5	2	2	86.4	0	0
G778	91.3	0	1	77.8	0	1
G779	83.8	1	1	77.4	0	1
G780	96.3	0	0	93.4	0	0
G781	86.3	1	1	64.3	2	3
G785	96.0	0	0	68.0	1	2
G786	87.6	1	1	71.2*	1	2
G787	97.0	0	0	62.2	2	3
G788	94.3	0	0	77.6*	0	1
U1C-1	96.1	0	0	107	0	0
U1C-2	100	0	0	99.9	0	0
U1C-3	96.1	0	0	103	0	0
U2C-1	100	0	0	102	0	0
U2C-2	100	0	0	102	0	0
U2C-3	98.7	0	0	115	0	0
U3C-1	101	0	0	89.2	0	0
U3C-2	101	0	0	90.1	0	0
U3C-3	101	0	0	88.3	0	0
U4Q-1	98.7	0	0	74.7	0	2
U4Q-2	100	0	0	73.7	0	2
U4Q-3	100	0	0	76.0	0	2

Table 6. Toxicity level (TL)[1] based on *Hyalella azteca* response assigned to each sediment sample[2] collected at the Portland Harbor site.

Station ID / Toxicity Level	*Hyalella azteca*					
	Survival			Biomass		
	Control-Adjusted Response (%)	Original TL[1]	Revised TL[1]	Control-Adjusted Response (%)	Original TL[1]	Revised TL[1]
U5Q-1	101	0	0	90.3	0	0
U5Q-2	103	0	0	104*	0	0
U5Q-3	98.7	0	0	91.1	0	0
U6TOC-1	103	0	0	67.6	1	3
U6TOC-2	97.4	0	0	83.5	0	1
U6TOC-3	98.7	0	0	53.5	3	3
Level 0		253 of 293 (86.3%)	215 of 293 (73.4%)		167 of 293 (57%)	94 of 293 (32.1%)
Level 1		19 of 293 (6.5%)	51 of 293 (17.4%)		53 of 293 (18.1%)	52 of 293 (17.7%)
Level 2		2 of 293 (0.7%)	7 of 293 (2.4%)		43 of 293 (14.7%)	65 of 293 (22.2%)
Level 3		19 of 293 (6.5%)	20 of 293 (6.8%)		30 of 293 (10.2%)	82 of 293 (28%)

[1] Toxicity Levels are: 0 (within the reference envelope range); 1 (within 10% of the REV); 2 (between 10% and 20% lower than the REV); 3 (>20% lower than the REV).

[2] All data have been taken from the Portland Harbor Query Manager database; results inconsistent with the July 2011 version of the BERA are noted with an asterisk (*).